

WVGA-TFT-PCAP-Modul Datenblatt

Modell SCF0500133GFR03

Kurzdaten

| | |
|-------------|-----------------------------|
| Hersteller | Data Image |
| Diagonale | 5,0" / 12,7 cm |
| Format | wide |
| Auflösung | 800 x 480 |
| Backlight | LED / 320 cd/m ² |
| Interface | RGB |
| Touchscreen | ja |
| Temperatur | -20... +70°C (Betrieb) |



Vertrieb durch:



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Confidential Document

DATA IMAGE CORPORATION

CTP Module Specification

Preliminary

ITEM NO.: SCF0500133GFR03

Table of Contents

| | |
|---|----|
| 1. COVER & CONTENTS | 1 |
| 2. RECORD OF REVISION | 2 |
| 3. GENERAL SPECIFICATIONS | 3 |
| 4. LCD ABSOLUTE MAXIMUM RATINGS | 3 |
| 5. LCD ELECTRICAL CHARACTERISTICS | 3 |
| 6. LCD TIMING SPECIFICATIONS | 4 |
| 7. LCD PIN CONNECTIONS | 6 |
| 8. CTP SPECIFICATIONS..... | 8 |
| 9. CTP REGISTERS | 10 |
| 10. OPTICAL CHARACTERISTIC | 15 |
| 11. BLOCK DIAGRAM | 18 |
| 12. QUALITY ASSURANCE | 19 |
| 13. PRODUCT LABEL DEFINE | 20 |
| 14. PRECAUTIONS IN USE LCM | 22 |
| 15. OUTLINE DRAWING | 23 |
| 16. PACKAGE INFORMATION..... | 24 |

| | | | | |
|--------------------|-----------|--------------|-------------|--------------|
| Customer Companies | R&D Dept. | Q.C. Dept. | Eng. Dept. | Prod. Dept. |
| | JACK | ERIC | GANY | HUANG |
| Approved by | Version: | Issued Date: | Sheet Code: | Total Pages: |
| | 2 | 4/MAY/12' | | 24 |

2. RECORD OF REVISION

| Rev | Date | Item | Page | Comment |
|-----|-----------|--------------------|--------------------|---|
| 1 | 8/MAR/12' | | | Initial Preliminary |
| 2 | 4/MAY/12' | 3 8 13 16 | 3 8 21 24 | 1.Add Weight 2.Add Finger 3.Modify Product Name Define 4.Add PACKAGE INFORMATION |
| | | | | |

3. GENERAL SPECIFICATIONS

Composition: 5 inch WVGA resolution display with a projected Capacitive Touch Panel (CTP).

Interface : RGB Interface for panel and I²C for the CTP.

| No. | Item | Specification | Unit |
|-----|----------------------|-------------------------------|--------|
| 1 | LCD size | 5.0 (Diagonal) | inch |
| 2 | Number of Pixel | 800(H) × (RGB) × 480 (V) | pixels |
| 3 | Pixel pitch | 0.135(H) × 0.135(V) | mm |
| 4 | Outline dimension | 118.5(W) x 77.55 (H) x 5.2(D) | mm |
| 5 | LCD Active area | 108(W) x 64.8(H) | mm |
| 6 | Sensor Active area | 108.8(W) x 65.6(H) | mm |
| 7 | Pixel arrangement | RGB Vertical stripe | |
| 8 | View Angle direction | 6 o'clock | |
| 9 | Back-light | LED Side-light type | |
| 10 | Display mode | Normally white | |
| 11 | Weight | 86.3(g) | g |

Remark : Our components and processes are compliant to RoHS standard.

4. LCD ABSOLUTE MAXIMUM RATINGS

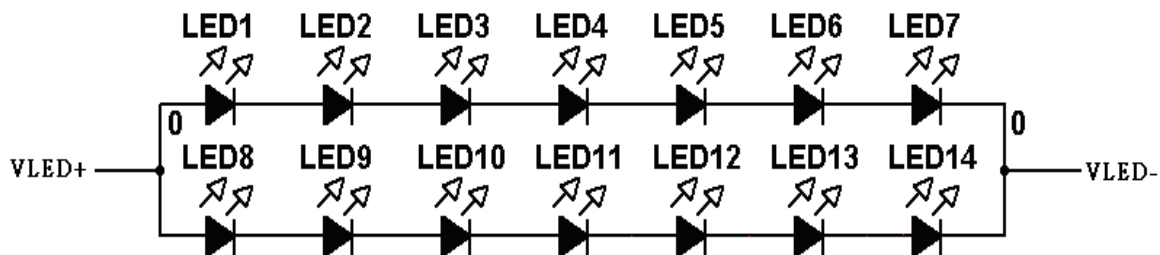
| Parameter | Symbol | MIN. | MAX. | Unit | Remark |
|-----------------------|--------|------|---------|------|--------|
| Power supply voltage | VDD | -0.5 | 5.0 | V | |
| Logic input voltage | VI | -0.3 | VDD+0.3 | V | |
| Operating temperature | Top | -20 | 70 | °C | |
| Storage temperature | Tst | -30 | 80 | °C | |

5. LCD ELECTRICAL CHARACTERISTICS

| Parameter | Symbol | MIN. | Typ. | MAX. | Unit | Remark |
|---------------------------------|-----------------|---------|------|---------|------|-----------|
| Power Supply voltage for LCD | VDD | 3.0 | 3.3 | 3.6 | V | |
| Power Supply Current for LCD | IDD | -- | -- | 220 | mA | VDD =3.3V |
| Power Supply voltage for LED | VLED | -- | 23.1 | -- | V | |
| Power Supply Current for LED | ILED | -- | 40 | -- | mA | Note 2 |
| “H” level logical input voltage | V _{IH} | 0.7*VDD | -- | VDD | V | Note 1 |
| “L” level logical input voltage | V _{IL} | GND | -- | 0.3*VDD | V | |

Note 1: HSYNC, VSYNC, DE, R/G/B Data, GND = 0V

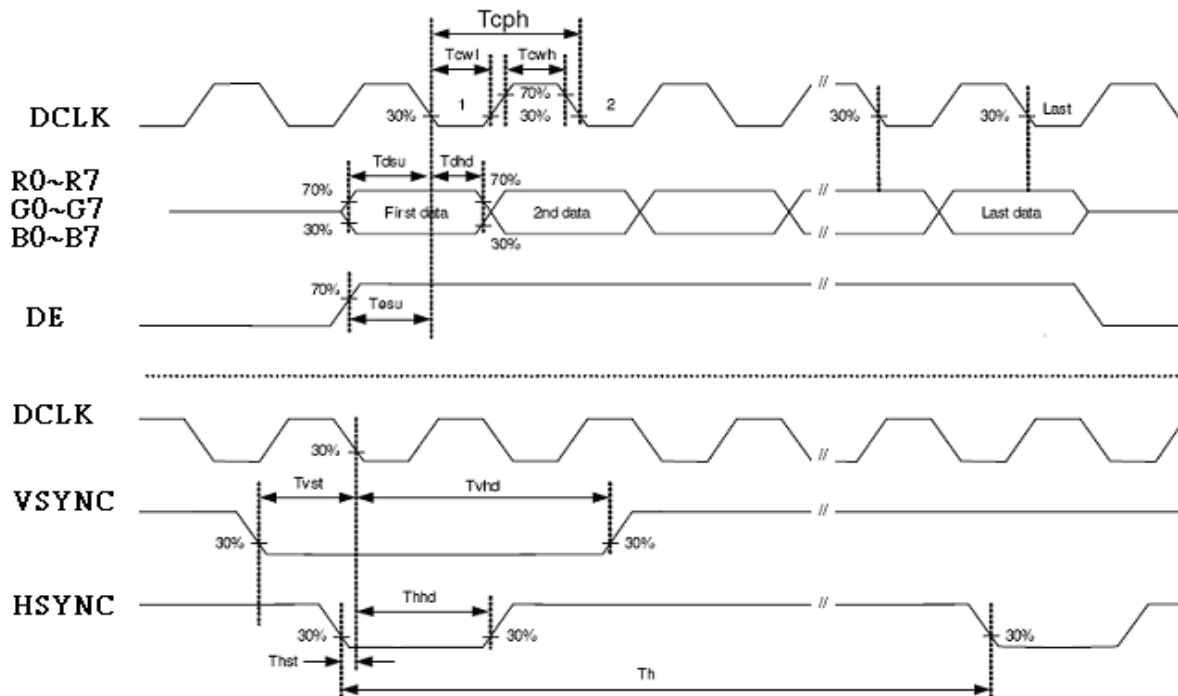
Note 2: The “LED life time” is defined as the module brightness decrease to 50% original brightness at Ta=25 and IL=40mA. The LED lifetime could be decreased if operating IL is larger than 40mA. The constant current driving method is suggested.



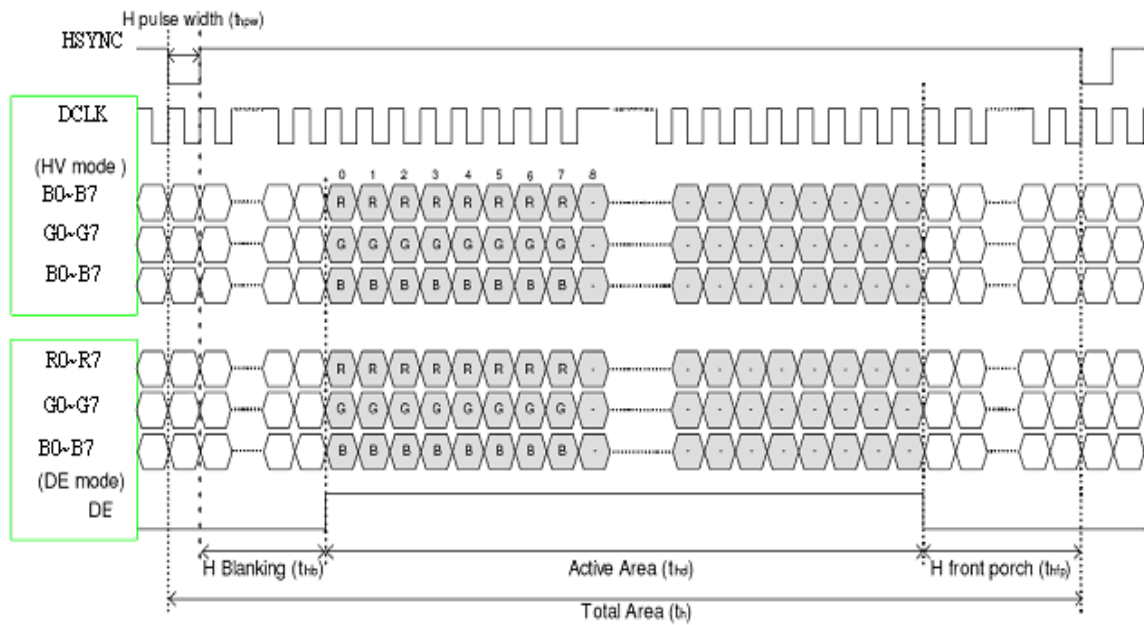
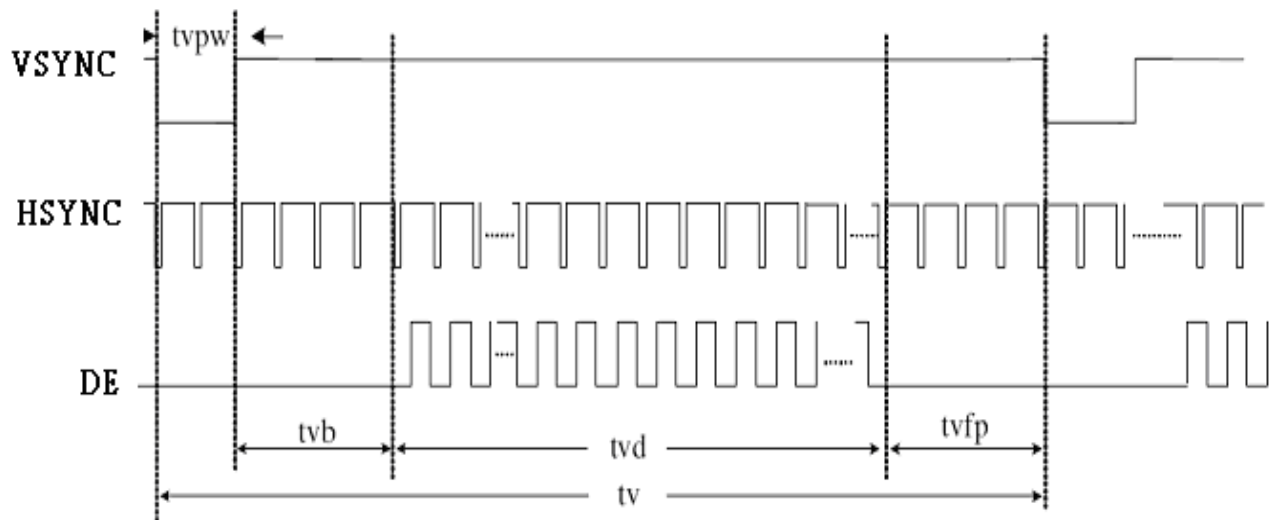
6.LCD TIMING CHARACTERISTICS

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Remark |
|-------------------------|--------|------|------|------|------|--------|
| DCLK cycle time | Tclk | 25 | | | ns | |
| DCLK frequency | fclk | | 33 | 40 | MHz | |
| DCLK pulse duty | Tcwh | 40 | 50 | 60 | % | |
| VSYNC setup time | Tvst | 8 | | | ns | |
| VSYNC hold time | Tvhd | 8 | | | ns | |
| HSYNC setup time | Thst | 8 | | | ns | |
| HSYNC hold time | Thhd | 8 | | | ns | |
| Data setup time | Tdasu | 8 | | | ns | |
| Data hold time | Tdahd | 8 | | | ns | |
| DE setup time | Tdesu | 8 | | | ns | |
| DE hold time | Tdehd | 8 | | | ns | |
| Horizontal display area | Thd | | 800 | | Tcph | |
| HSYNC period time | Th | | 928 | | Tcph | |
| HSYNC width | Thwh | 1 | 48 | | Tcph | |
| HSYNC back porch | Thbp | | 40 | | Tcph | |
| HSYNC front porch | Thfp | | 40 | | Tcph | |
| Vertical display area | Tvd | | 480 | | th | |
| VSYNC period time | Tv | | 525 | | th | |
| VSYNC width | Tvwh | | 3 | | th | |
| VSYNC back porch | Tvbp | | 29 | | th | |
| VSYNC front porch | Tvfp | | 13 | | th | |

Timing Diagram of Interface Signal



Sampling clock timing


Horizontal display timing range


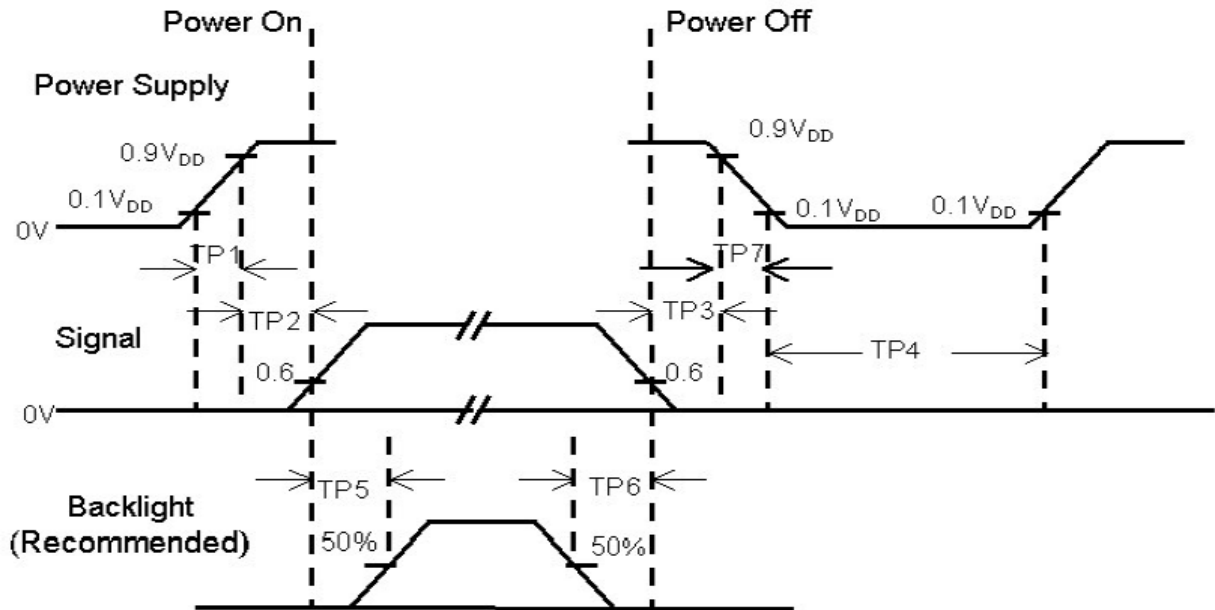
7. LCD PIN CONNECTIONS

7.1 Input Pins Function

| No | Symbol | I/O | Description |
|----|-----------|-----|---------------------------------|
| 1 | VLED- | P | Power for LED backlight cathode |
| 2 | VLED+ | P | Power for LED backlight anode |
| 3 | GND | P | Power ground |
| 4 | VDD | P | Power voltage |
| 5 | R0 | I | Red data (LSB) |
| 6 | R1 | I | Red data |
| 7 | R2 | I | |
| 8 | R3 | I | |
| 9 | R4 | I | |
| 10 | R5 | I | |
| 11 | R6 | I | |
| 12 | R7 | I | Red data (MSB) |
| 13 | G0 | I | Green data (LSB) |
| 14 | G1 | I | Green data |
| 15 | G2 | I | |
| 16 | G3 | I | |
| 17 | G4 | I | |
| 18 | G5 | I | |
| 19 | G6 | I | |
| 20 | G7 | I | Green data (MSB) |
| 21 | B0 | I | Blue data (LSB) |
| 22 | B1 | I | Blue data |
| 23 | B2 | I | |
| 24 | B3 | I | |
| 25 | B4 | I | |
| 26 | B5 | I | |
| 27 | B6 | I | |
| 28 | B7 | I | Blue data (MSB) |
| 29 | DGND | P | Digital ground |
| 30 | DCLK | I | Pixel clock |
| 31 | DISP | I | Display On / Off |
| 32 | HSYNC(HS) | I | Horizontal sync signal |
| 33 | VSYNC(VS) | I | Vertical sync signal |
| 34 | DE | I | Data enable |
| 35 | NC | - | No Connect |
| 36 | GND | P | Power ground |
| 37 | NC | - | No Connect |
| 38 | NC | - | |
| 39 | NC | - | |
| 40 | NC | - | |

I/O: I= input, O= output, P= Power

7.2 Power Sequence



| Item | Min. | Typ. | Max. | Unit | Remark |
|------|------|------|------|------|--------|
| TP1 | 0.5 | -- | 10 | msec | |
| TP2 | 0 | -- | 50 | msec | |
| TP3 | 0 | -- | 50 | msec | |
| TP4 | 1000 | -- | -- | msec | |
| TP5 | 200 | -- | -- | msec | |
| TP6 | 200 | -- | -- | msec | |
| TP7 | 0.5 | -- | 10 | msec | |

Note:

- (1) The supply voltage of the external system for the module input should be the same as the definition of VDD.
- (2) Apply the lamp voltage within the LCD operation range. When the back-light turns on before the LCD operation or the LCD turns off before the back-light turns off, the display may momentarily become white.
- (3) In case of VDD = off level, please keep the level of input signal on the low or keep a high impedance.
- (4) TP4 should be measured after the module has been fully discharged between power off and on period.
- (5) Interface signal shall not be kept at high impedance when the power is on.

| Symbol | Parameter | Rating | | | Unit |
|---------------------|--|--------|------|------|------|
| | | Min. | Typ. | Max. | |
| f _{SCL} | SCL clock frequency | 0 | - | 400 | kHz |
| t _{LOW} | Low period of the SCL clock | 1.3 | - | - | us |
| t _{HIGH} | High period of the SCL clock | 0.6 | - | - | us |
| t _f | Signal falling time | - | - | 300 | ns |
| t _r | Signal rising time | - | - | 300 | ns |
| t _{SU_STA} | Set up time for a repeated START condition | 0.6 | - | - | us |
| t _{HD_STA} | Hold time (repeated) START condition. After this period, the first clock pulse is generated. | 0.6 | - | - | us |
| t _{SU_DAT} | Data set up time | 100 | - | - | ns |
| t _{HD_DAT} | Data hold time | 0 | - | 0.9 | us |
| t _{SU_STO} | Set up time for STOP condition | 0.6 | - | - | us |
| t _{BUF} | Bus free time between a STOP and START condition | 1.3 | - | - | us |
| C _b | Capacitive load for each bus line | - | - | 400 | pF |

8.4.1 Register Read

For reading register value from I²C device, host has to tell I²C device the Start Register Address before reading corresponding register value.

| I ² C Start | I ² C Header (W) | Start Reg. Addr. (a) | I ² C Stop | I ² C Start | I ² C Header (R) | Value of Reg(a) | Value of Reg(a+1) | ... | Value of Reg(a+n) | I ² C Stop |
|------------------------|-----------------------------|----------------------|-----------------------|------------------------|-----------------------------|-----------------|-------------------|-----|-------------------|-----------------------|
|------------------------|-----------------------------|----------------------|-----------------------|------------------------|-----------------------------|-----------------|-------------------|-----|-------------------|-----------------------|

Figure 1 - Register Read Format.

The I²C host interface protocol supports Repeated Register Read. That is, once the Start Register Address has been set by host, consequent I²C Read(R) transactions will directly read register values starting from the Start Register Address without setting address first, as shown in Figure 2.

| I ² C Start | I ² C Header (R) | Value of Reg(a) | Value of Reg(a+1) | ... | Value of Reg(a+n) | I ² C Stop | I ² C Start | I ² C Header (R) | Value of Reg(a) | Value of Reg(a+1) | ... | Value of Reg(a+n) | I ² C Stop |
|------------------------|-----------------------------|-----------------|-------------------|-----|-------------------|-----------------------|------------------------|-----------------------------|-----------------|-------------------|-----|-------------------|-----------------------|
|------------------------|-----------------------------|-----------------|-------------------|-----|-------------------|-----------------------|------------------------|-----------------------------|-----------------|-------------------|-----|-------------------|-----------------------|

Figure 2 - Repeated Register Read.

8.4.2 Register Write

For writing register to I²C device, host has to tell I²C device the Start Register Address in each I²C Register Write transaction. Register values to the I²C device will be written to the address starting from the Start Register Address described in Register Write I²C transaction as shown in Figure 3.

| I ² C Start | I ² C Header (W) | Start Reg. Addr. (a) | Value of Reg(a) | Value of Reg(a+1) | ... | Value of Reg(a+n) | I ² C Stop |
|------------------------|-----------------------------|----------------------|-----------------|-------------------|-----|-------------------|-----------------------|
|------------------------|-----------------------------|----------------------|-----------------|-------------------|-----|-------------------|-----------------------|

9. CTP REGISTERS

The provides a register set for host to configure device attributes and retrieve information about fingers, proximity, gestures or raw data through device host interface. Host interface registers are listed below.

| Host Interface Registers (Report Page) | | | | | | | | | |
|--|---------------------------|-----------------------------|---------------------------|----------|-------|--------------------|-----------------------|-----------------|-----------------|
| Reg. Addr. | Name | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| 0x00 | Firmware Version | Version (RO) | | | | | | | |
| 0x01 | Status Reg. | Error Code (RO) | | | | Device Status (RO) | | | |
| 0x02 | Device Control Reg. | Auto Tune (RW) | Flash Update Disable (RW) | Reserved | | Gest. Enable (RW) | Proximity Enable (RW) | Power Down (RW) | Power Down (RW) |
| 0x03 | Timeout to Idle Reg. | Timeout to Idle (sec.) (RW) | | | | | | | |
| 0x04 | XY Resolution (High Byte) | X_Res_H (RW) | | | | Y_Res_H (RW) | | | |
| 0x05 | X Resolution (Low Byte) | X_Res_L (RW) | | | | | | | |
| 0x06 | Y Resolution (Low Byte) | Y_Res_L (RW) | | | | | | | |
| ⋮ | ⋮ | ⋮ | | | | | | | |
| 0x0C | Firmware Revision 3 | FW_Rev_3 | | | | | | | |
| 0x0D | Firmware Revision 2 | FW_Rev_2 | | | | | | | |
| 0x0E | Firmware Revision 1 | FW_Rev_1 | | | | | | | |
| 0x0F | Firmware Revision 0 | FW_Rev_0 | | | | | | | |
| 0x10 | Fingers / Gesture | Gesture Code (RO) | | | | Fingers (RO) | | | |
| ⋮ | ⋮ | ⋮ | | | | | | | |
| 0x12 | XY0 Coord. (High Byte) | Valid 0 (RO) | X0_H (RO) | | | Reserved | Y0_H (RO) | | |
| 0x13 | X0 Coord. (Low Byte) | X0_L (RO) | | | | | | | |
| 0x14 | Y0 Coord. (Low Byte) | Y0_L (RO) | | | | | | | |
| 0x15 | XY1 Coord. (High Byte) | Valid 1 (RO) | X1_H (RO) | | | Reserved | Y1_H (RO) | | |
| 0x16 | X1 Coord. (Low Byte) | X1_L (RO) | | | | | | | |
| 0x17 | Y1 Coord. (Low Byte) | Y1_L (RO) | | | | | | | |
| ⋮ | ⋮ | ⋮ | | | | | | | |
| 0x40 | Data [0] (High Byte) | | | | | Data_H [0] | | | |
| 0x41 | Data [0] (Low Byte) | Data_L [0] | | | | | | | |
| 0x42 | Data [1] (High Byte) | | | | | Data_H [1] | | | |
| 0x43 | Data [1] (Low Byte) | Data_L [1] | | | | | | | |
| 0x44 | Data [2] (High Byte) | | | | | Data_H [2] | | | |
| 0x45 | Data [2] (Low Byte) | Data_L [2] | | | | | | | |
| ⋮ | ⋮ | ⋮ | | | | | | | |
| 0x7E | Raw Data[31] (High Byte) | | | | | Data_H [31] | | | |
| 0x7F | Raw Data [31] (Low Byte) | Data_L [31] | | | | | | | |

| | | |
|-------------------|-----------|------------------|
| 0x80 ⋮ 0xFE | ⋮ | Reserved |
| 0xFF | Page Reg. | Page Number (RW) |

Figure 4 – Host Interface Registers

9.1 Firmware Version Register

| Reg. Addr. | Name | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|------------|------------------|--------------|-------|-------|-------|-------|-------|-------|-------|
| 0x00 | Firmware Version | Version (RO) | | | | | | | |

Firmware Version Register provides version information about current firmware. Host application can support version control in firmware upgrade function by reading Firmware Version Register and comparing with the version of new firmware binary.

9.2 Status Register

| Reg. Addr. | Name | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|------------|-------------|-----------------|-------|-------|-------|--------------------|-------|-------|-------|
| 0x01 | Status Reg. | Error Code (RO) | | | | Device Status (RO) | | | |

Status Register shows current status of the device to host, including Device Status and Error Code. Init status represents that the device is in Init state and not ready for host access. Host has to wait for the device to change into Normal state before accessing registers other than Status Register.

If Device Status shows Error, the Error Code field in the Status Register gives reason of the error.

| Device Status | |
|---------------|-------------|
| 0x0 | Normal |
| 0x1 | Init |
| 0x2 | Error |
| 0x3 | Auto Tuning |
| 0x4 | Idle |
| 0x5 | Power Down |
| 0x6 | Reserved |
| ... | |
| 0xF | |

| Error Code | |
|------------|------------------|
| 0x0 | No Error |
| 0x1 | Invalid Address |
| 0x2 | Invalid Value |
| 0x3 | Invalid Platform |
| 0x4 | Reserved |
| ... | |
| 0xF | |

9.3 Device Control Register

| Reg. Addr. | Name | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|------------|------------------|----------------|---------------------------|----------|-------|-------------------|-----------------------|-----------------|------------|
| 0x02 | Firmware Version | Auto Tune (RW) | Flash Update Disable (RW) | Reserved | | Gest. Enable (RW) | Proximity Enable (RW) | Power Down (RW) | Reset (RW) |

Device Control Register provides device control bits for host to reset the device, power down the device, enable/disable proximity detection, enable/disable gestures or data mode. Power Down state will be updated to Device Status field of Status Register, 0x01, after setting/clearing Power Down bit. Set Data Mode to 0x1 for Raw Data mode. Set Data Mode to 0x02 for Delta mode. Set Auto Tune to 0x1 will enable Auto Tune. Set Flash Update Disable to 0x00 will write the Auto Tune's result to flash.

9.4 Proximity Enable and Timeout to Idle Register

| Reg. Addr. | Name | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|------------|----------------------|-----------------------------|-------|-------|-------|-------|-------|-------|-------|
| 0x03 | Timeout to Idle Reg. | Timeout to Idle (sec.) (RW) | | | | | | | |

Timeout to Idle Register provides timeout control to enter Idle Mode for host. The touch controller will enter Idle Mode after the number of seconds specified in Timeout to Idle Register if there is no touch detected in this period. Set this field to 0xFF will disable Idle Mode. Set this field to 0 will entering Idle Mode immediately. Idle state will be updated to Device Status field of Status Register, 0x01, after entering Idle Mode automatically.

The default value of Timeout to Idle Register is set to 0x08 for 8 seconds to Idle Mode.

9.5 XY Resolution Registers

| Reg. Addr. | Name | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|------------|---------------------------|------------------|-------|-------|-------|------------------|-------|-------|-------|
| 0x04 | XY Resolution (High Byte) | X _ Res _ H (RW) | | | | Y _ Res _ H (RW) | | | |
| 0x05 | X Resolution (Low Byte) | X _ Res _ L (RW) | | | | | | | |
| 0x06 | Y Resolution (Low Byte) | Y _ Res _ L (RW) | | | | | | | |

XY Resolution Registers represents resolution of X and Y coordinates of the touch screen. Host can change XY Resolution at run time by updating new resolution to these registers.

9.6 Firmware Revision Registers

| Reg. Addr. | Name | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|------------|---------------------|----------|-------|-------|-------|-------|-------|-------|-------|
| 0x0C | Firmware Revision 3 | FW_Rev_3 | | | | | | | |
| 0x0D | Firmware Revision 2 | FW_Rev_2 | | | | | | | |
| 0x0E | Firmware Revision 1 | FW_Rev_1 | | | | | | | |
| 0x0F | Firmware Revision 0 | FW_Rev_0 | | | | | | | |

Firmware Revision Registers provide revision information about current firmware.

9.7 Fingers and Gesture Register

| Reg. Addr. | Name | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|------------|-------------------|-------------------|-------|-------|-------|--------------|-------|-------|-------|
| 0x10 | Fingers / Gesture | Gesture Code (RO) | | | | Fingers (RO) | | | |

Fingers field represents number of fingers detected by touch controller. The coordinates of each finger detected are represents in X Coordinate and Y Coordinate fields. Gesture Register tells host which gesture is detected by the controller. Gesture Codes for each gesture are listed below.

| Device Status | |
|---------------|---------------------------------------|
| 0x0 | No Detected |
| 0x1 | Single Touch Tap |
| 0x2 | Single Touch Double Tap |
| 0x3 | Single Touch Slide Up |
| 0x4 | Single Touch Slide Down |
| 0x5 | Single Touch Slide Left |
| 0x6 | Single Touch Slide Right |
| 0x7 | Two Finger Slide Up |
| 0x8 | Two Finger Slide Down |
| 0x9 | Two Finger Slide Left |
| 0xA | Two Finger Slide Right |
| 0x0B | Pinch In (Zoom In) |
| 0x0C | Pinch Out (Zoom Out) |
| 0x0D | Rotate CW (CCW, for Top Down Mapping) |
| 0x0E | Rotate CCW (CW, for Top Down Mapping) |
| 0x0F | Object Approaching |
| 0x10 | Object Leaving |
| 0x11 | Reserved |
| ... | |
| 0x1F | |

9.8 XY Coordinate Registers

| Reg. Addr. | Name | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|------------|------------------------|--------------|-----------|-------|-------|----------|-----------|-------|-------|
| 0x12 | XY0 Coord. (High Byte) | Valid 0 (RO) | X0_H (RO) | | | Reserved | Y0_H (RO) | | |
| 0x13 | X0 Coord. (Low Byte) | X0_L (RO) | | | | | | | |
| 0x14 | Y0 Coord. (Low Byte) | Y0_L (RO) | | | | | | | |

XY Coordinate Registers represent the XY coordinates for each touch point ID. Valid bit field tells that this point ID is valid and the XY information represents a real touch point on touch sensor.

Z Coordinate Register indicates the touch strength of corresponding touch point ID.

9.9 Data Registers

| Reg. Addr. | Name | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|------------|----------------------|--------------|-------|-------|-------|-------|-------|-------|-------|
| 0x40 | Data [0] (High Byte) | Data _ H [0] | | | | | | | |
| 0x41 | Data [0] (Low Byte) | Data _ L [0] | | | | | | | |
| 0x42 | Data [1] (High Byte) | Data _ H [1] | | | | | | | |
| 0x43 | Data [1] (Low Byte) | Data _ L [1] | | | | | | | |
| 0x44 | Data [2] (High Byte) | Data _ H [2] | | | | | | | |
| 0x45 | Data [2] (Low Byte) | Data _ L [2] | | | | | | | |
| ⋮ | ⋮ | ⋮ | | | | | | | |

| | | |
|------|-----------------------------|---------------|
| 0x7E | Raw Data[31] (High Byte) | Data _ H [31] |
| 0x7F | Raw Data [31] (Low Byte) | Data _ L [31] |

Data Registers provide raw or delta data detected by touch sensor controller. If Data Mode of Device Control Register (0x02) is set to Raw Mode, Data Registers represent raw data. If Data Mode is set to Delta Mode, Data Registers represent delta data. Data Registers will be updated for each scan frame when in raw or delta mode. Otherwise, Raw Data Registers will not be updated.

9.10 Page Register

| Reg. Addr. | Name | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|------------|-----------|------------------|-------|-------|-------|-------|-------|-------|-------|
| 0xFF | Page Reg. | Page Number (RW) | | | | | | | |

Page Register provides changing page of Host Interface Register.
Default page is Report Page.

| Page Number | Description |
|-------------|---------------|
| 0x00 | Report Page |
| 0x01 | AutoTune Page |

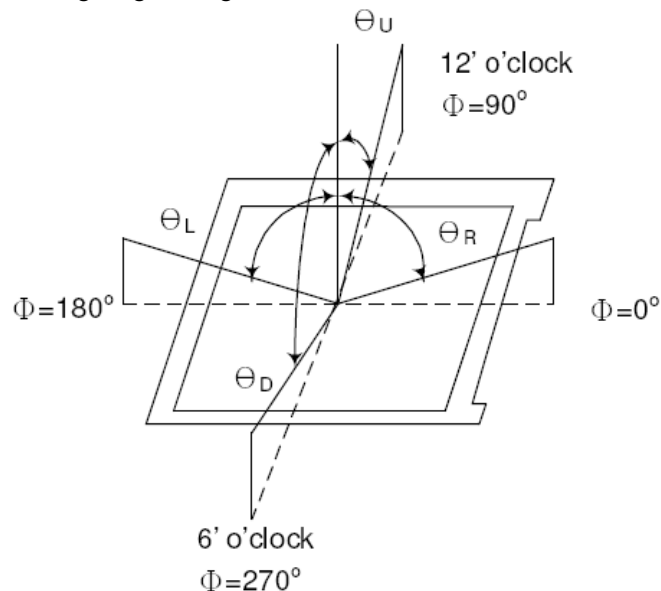
10. OPTICAL CHARACTERISTIC

| Item | | Symbol | Condition | Min. | Typ. | Max. | Unit | Remark |
|------------------------------|------|--------------------|---------------------------------|------|------|------|-------------------|----------------|
| Response time | Rise | TON | Normal $\theta=\Phi=0^\circ$ | - | 2 | 4 | ms | Note3 , 4 |
| | Fall | TOFF | | - | 6 | 12 | ms | |
| Contrast ratio | | CR | | 480 | 600 | | | Note 2 , 4 |
| Viewing angle | L | =180°(9 o ' clock) | | 65 | 75 | - | Deg. | Note 1 , 4 |
| | R | =0°(3 o ' clock) | | 65 | 75 | - | | |
| | U | =90°(12 o ' clock) | | 50 | 60 | - | | |
| | D | =270°(6 o ' clock) | | 60 | 70 | - | | |
| Brightness (Center) | | | Normal $\theta=\Phi=0^\circ$ | 270 | 340 | -- | cd/m ² | Note 4 , 6 |
| Uniformity | | | | 70 | -- | -- | % | Note 4 , 5 , 6 |
| Color chromaticity (CIE1931) | | White | | X | 0.26 | 0.31 | 0.36 | Note 4 , 6 |
| | | | y | 0.28 | 0.33 | 0.38 | | |

Test Conditions:

Measuring surrounding: dark room, LED current IL: 40mA , Ambient temperature: 25±2°C
15 min. warm-up time.

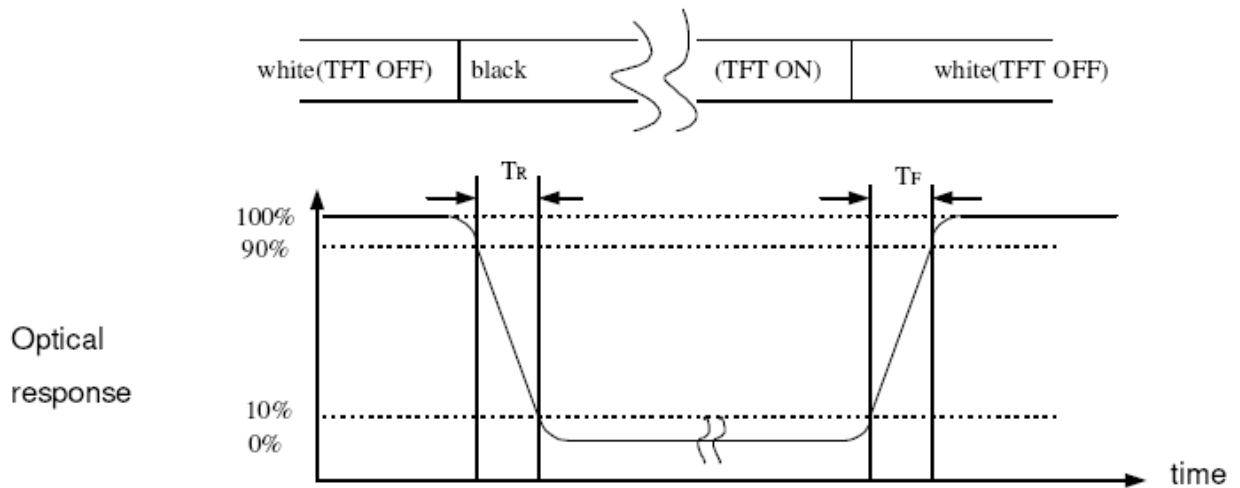
Note 1 : Definition of viewing angle range



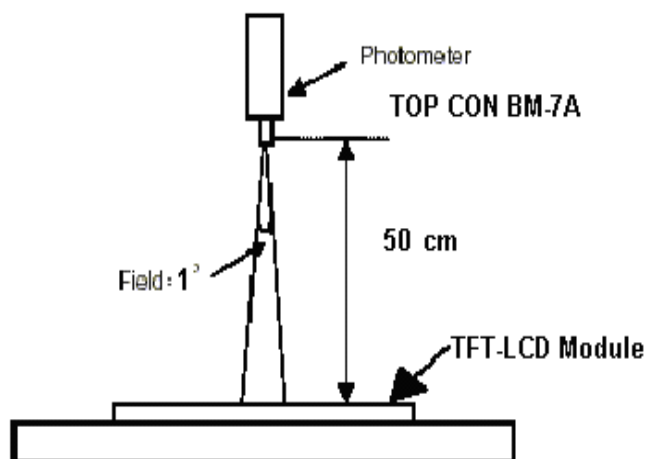
Note 2 : Definition of Contrast Ratio (CR):
Measured at the center point of panel

$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

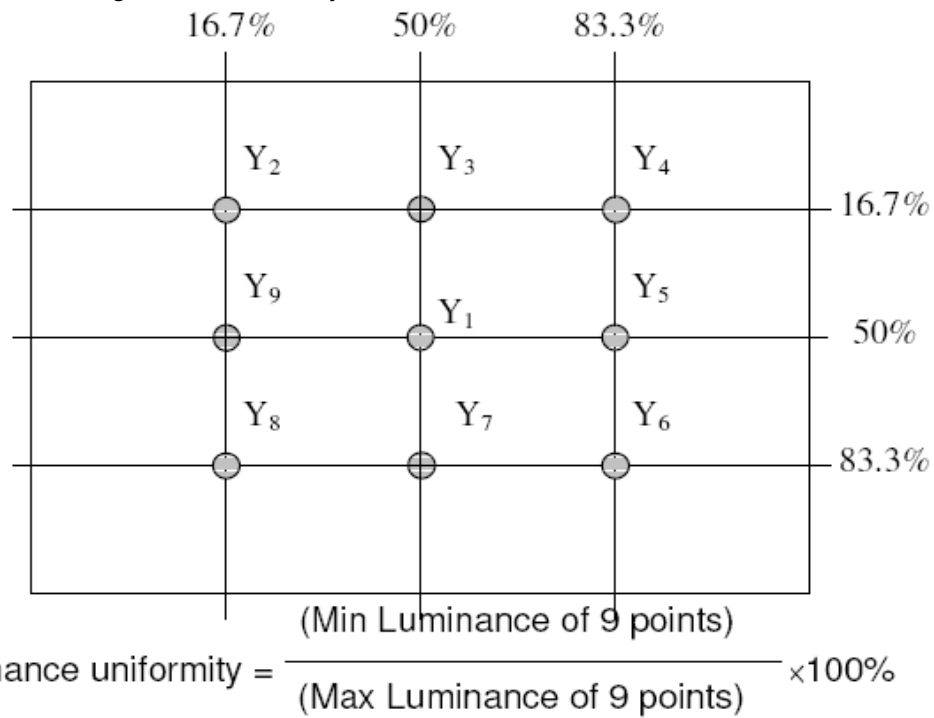
Note 3 : Definition of Response Time: Sum of T_{OFF} and T_{ON}



Note 4 : The method of optical measurement:

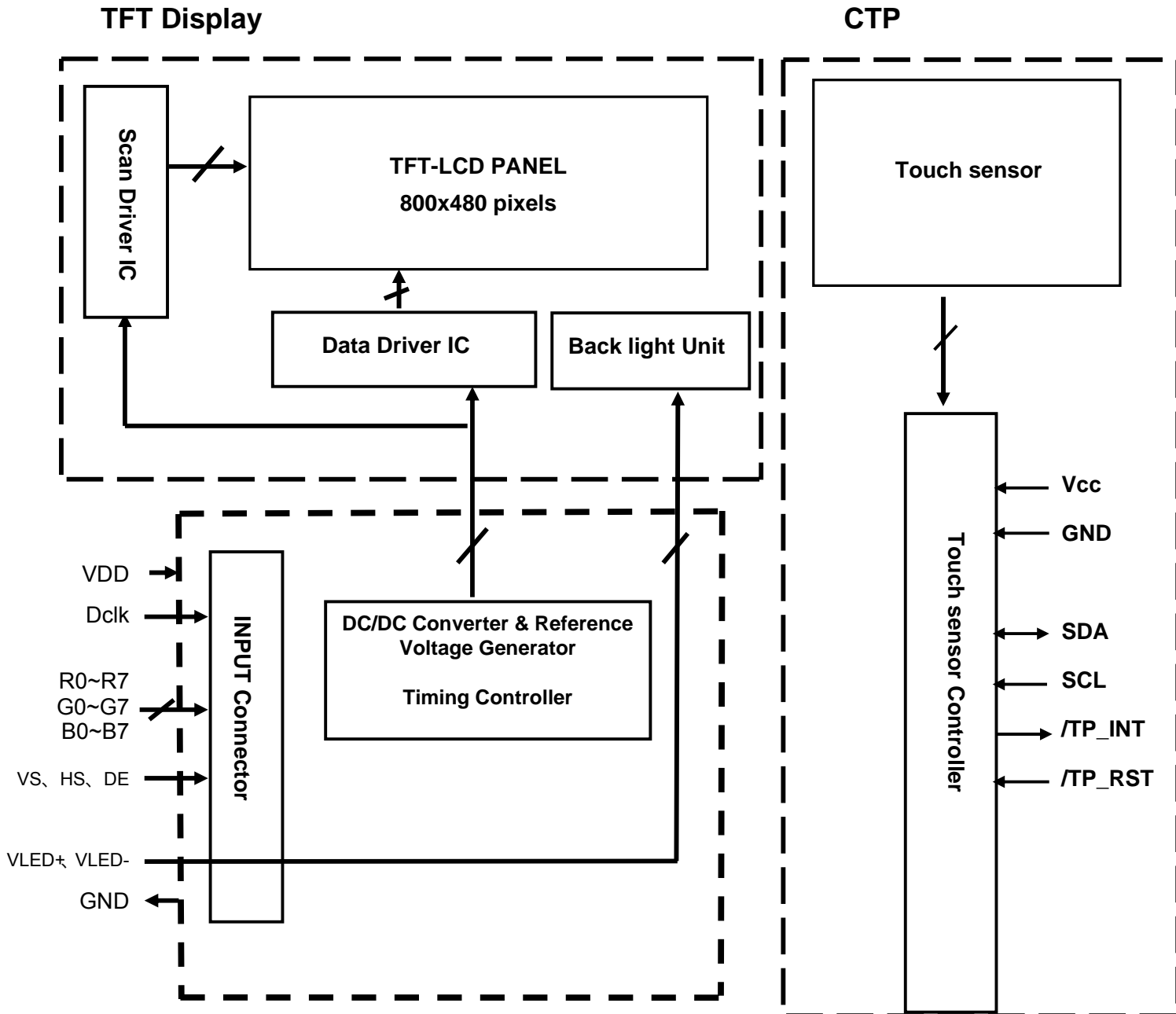


Note 5 : Definition of brightness uniformity



Note 6 : Measured at the center area of the panel when all terminals of LCD panel are electrically open.

11. BLOCK DIAGRAM



12. QUALITY ASSURANCE

| No. | Item | Test Conditions | Remark |
|-----|--|---|-------------------------------------|
| 1 | High Temperature Storage | Ta = 80 240 hrs | Note 1, 3 |
| 2 | Low Temperature Storage | Ta = -30 240hrs | Note 1, 3 |
| 3 | High Temperature Operation | Ta = 70 240hrs | Note 1, 3 |
| 4 | Low Temperature Operation | Ta = -20 240hrs | Note 1, 3 |
| 5 | Operate at High Temperature and Humidity | +60 , 90%RH 240 hrs | Note 3 |
| 6 | Thermal Cycling Test (non operation) | -30 (30 min) + 80 (30 min), 200 cycles | Note 3 |
| 7 | Vibration Test | 1 Random: 1.04Grrms,5~500HZ, X/Y/X 30min/each direction 2 Sine: Freq. Range:8~33.3Hz Stoke:1.3mm Sweep:2.9G,33.3~400Hz X/Z:2hr,Y:4hr cyc:15min | |
| 8 | Mechanical Shock | 100G 6ms,±X, ±Y, ±Z 3 times for each direction | JIS C7021, A-10 (Condition A) |
| 9 | Vibration Test(with carton) | Random Vibration : 0.015G ² /Hz from 5-200HZ, -6dB/Octave from 200-400HZ 2 hours for each direction of X. Y. Z. | |
| 10 | Drop Test(with carton) | Height:60 cm 1 corner, 3 edges, 6 surfaces | JIS Z0202 |
| 11 | Electro Static Discharge | ± 200V, 200Pf(0Ω) 1 time/each terminal | |

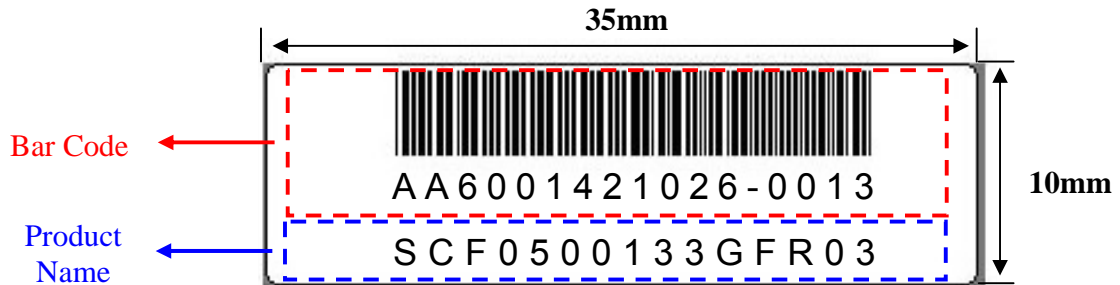
Note 1: Ta is the ambient temperature of samples.

Note 2: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but doesn't guarantee all the cosmetic specification.

Note 3: Before cosmetic and function tests, the product must have enough recovery time, at least 2 hours at room temperature.

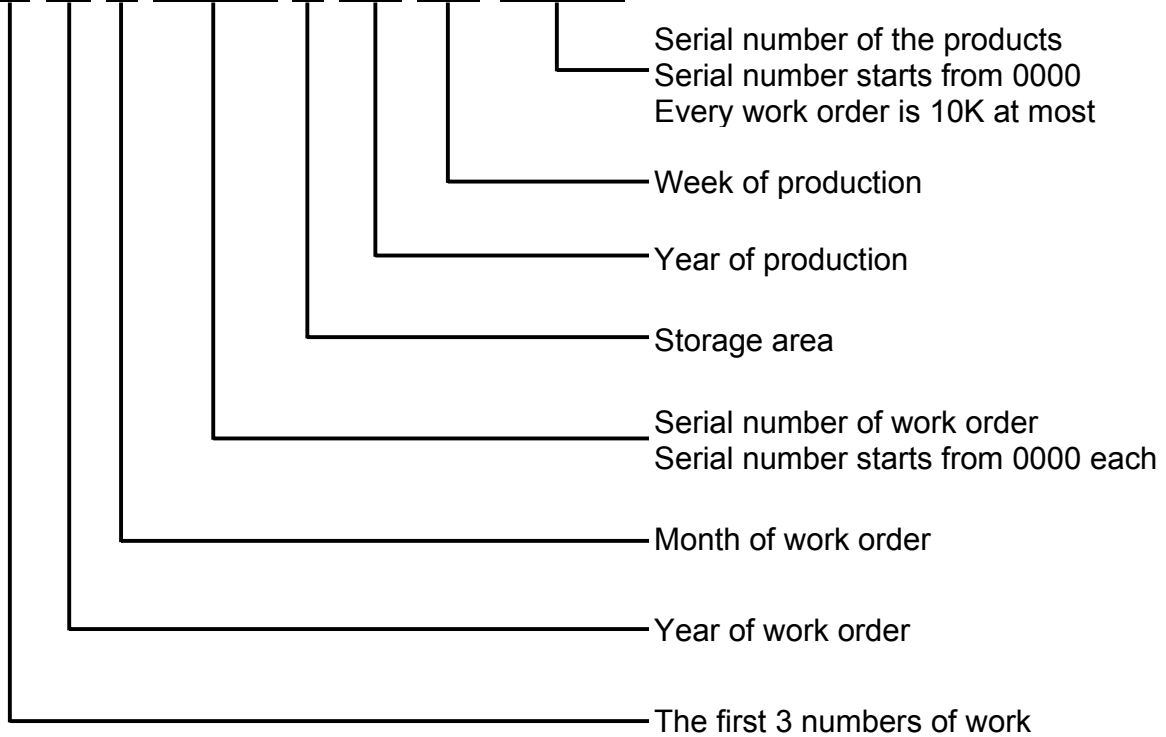
13. PRODUCT LABEL DEFINE

Product Label style:

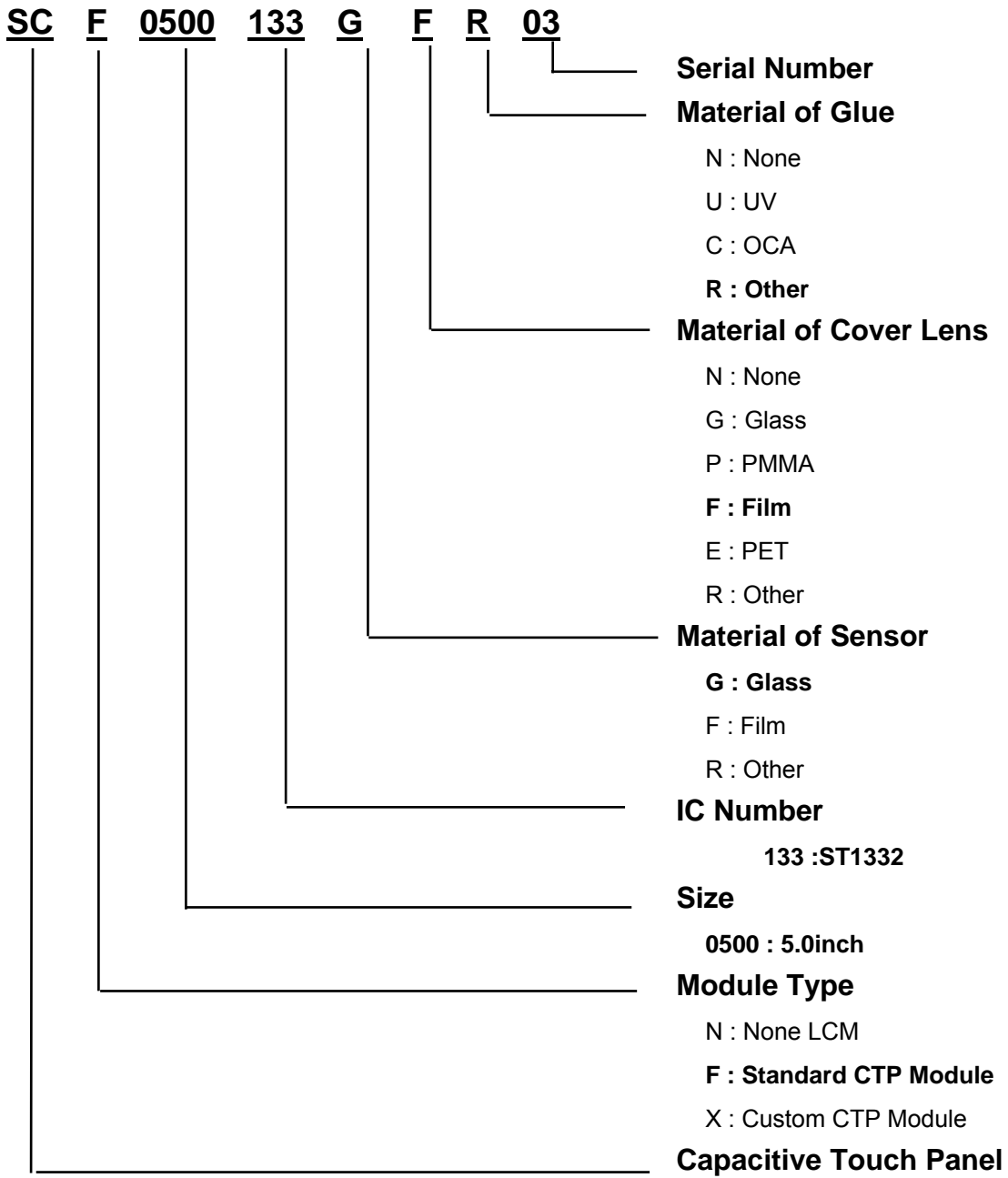


Bar Code Define:

A A 6 0014 2 10 26-0013



Product Name Define:



14. PRECAUTION FOR USING LCM

1. ASSEMBLY PRECAUTIONS

- (1) You must mount a module using holes arranged in four corners or four sides.
- (2) You should consider the mounting structure so that uneven force (ex. Twisted stress) is not applied to the module. And the case on which a module is mounted should have sufficient strength so that external force is not transmitted directly to the module.
- (3) Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment.
- (4) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.
- (5) Do not open the case because inside circuits do not have sufficient strength.
- (6) Please do not take a LCD module to pieces and reconstruct it. Resolving and reconstructing modules may cause them not to work well.
- (7) Please do not touch metal frames with bare hands and soiled gloves. A color change of the metal frames can happen during a long preservation of soiled LCD modules.
- (8) Please pay attention to handling lead wire of backlight so that it is not tugged in connecting with inverter.

2. OPERATING PRECAUTIONS

- (1) Please be sure to turn off the power supply before connecting and disconnecting signal input cable.
- (2) Please do not change variable resistance settings in LCD module. They are adjusted to the most suitable value. If they are changed, it might happen LCD does not satisfy the characteristics specification
- (3) Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.
- (4) When fixed patterns are displayed for a long time, remnant image is likely to occur.
- (5) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.
- (6) Please consider that LCD backlight takes longer time to become stable of radiation characteristics in low temperature than in room temperature.

3. ELECTROSTATIC DISCHARGE CONTROL

- (1) The operator should be grounded whenever he/she comes into contact with the module. Never touch any of the conductive parts such the copper leads on the PCB and the interface terminals with any

parts of the human body.

- (2) The modules should be kept in antistatic bags or other containers resistant to static for storage.
- (3) Only properly grounded soldering irons should be used.
- (4) If an electric screwdriver is used, it should be well grounded and shielded from commutator sparks.
- (5) The normal static prevention measures should be observed for work clothes and working benches; for the latter conductive (rubber) mat is recommended
- (6) Since dry air is inductive to statics, a relative humidity of 50-60% is recommended.

4. STORAGE PRECAUTIONS

- (1) When you store LCDs for a long time, it is recommended to keep the temperature between 0°C-40°C without the exposure of sunlight and to keep the humidity less than 90%RH.
- (2) Please do not leave the LCDs in the environment of high humidity and high temperature such as 60°C 90%RH
- (3) Please do not leave the LCDs in the environment of low temperature; below -20°C.

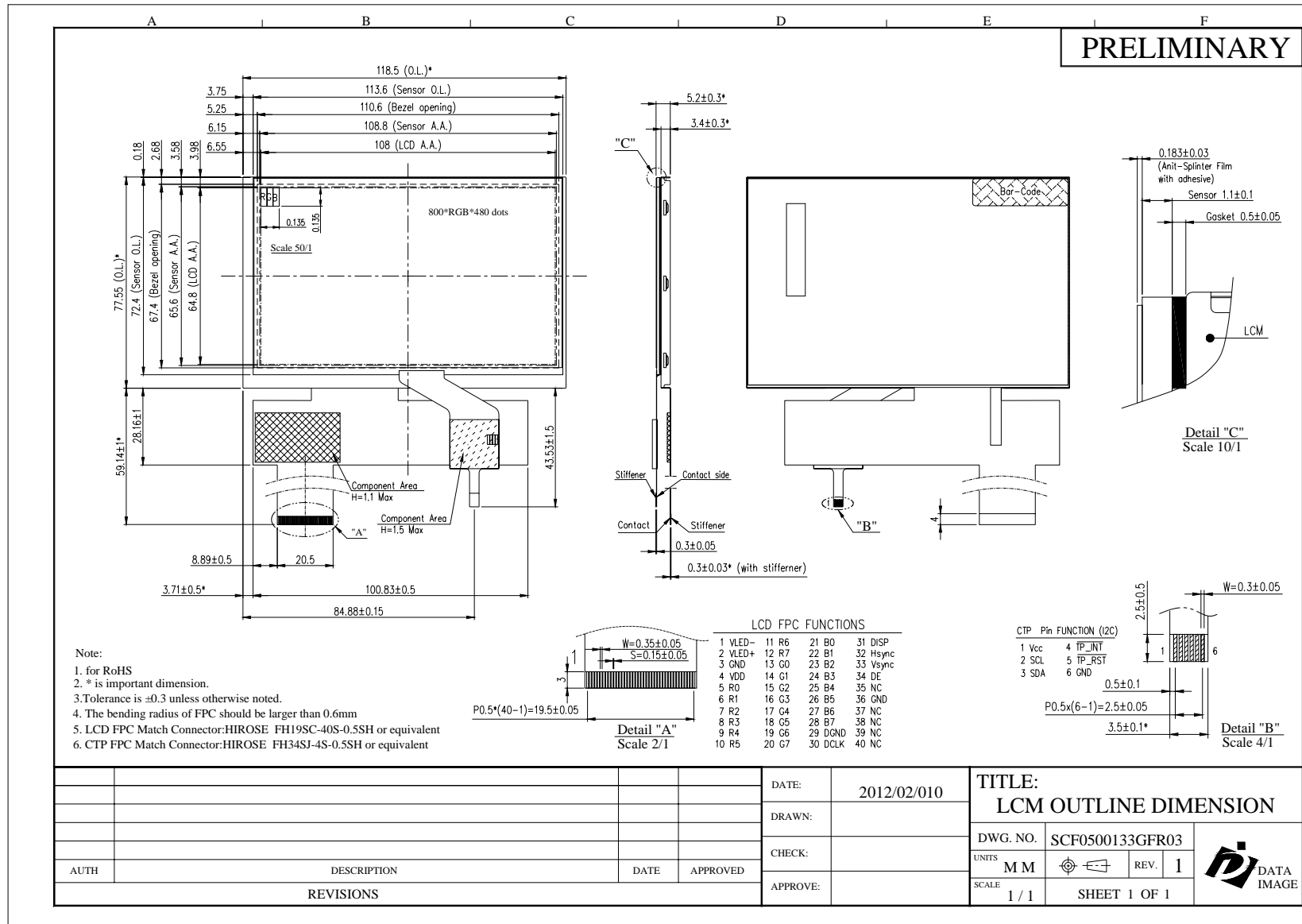
5. OTHERS

- (1) A strong incident light into LCD panel might cause display characteristics' changing inferior because of polarizer film, color filter, and other materials becoming inferior. Please do not expose LCD module direct sunlight and strong UV rays
- (2) Please pay attention to a panel side of LCD module not to contact with other materials in preserving it alone.
- (3) For the packaging box, please pay attention to the followings:
 - a. Please do not pile them up more than 5 boxes. (They are not designed so.) And please do not turn over.
 - b. Please handle packaging box with care not to give them sudden shock and vibrations. And also please do not throw them up.
 - c. Packing box and inner case for LCDs are made of cardboard. So please pay attention not to get them wet. (Such like keeping them in high humidity or wet place can occur getting them wet.)

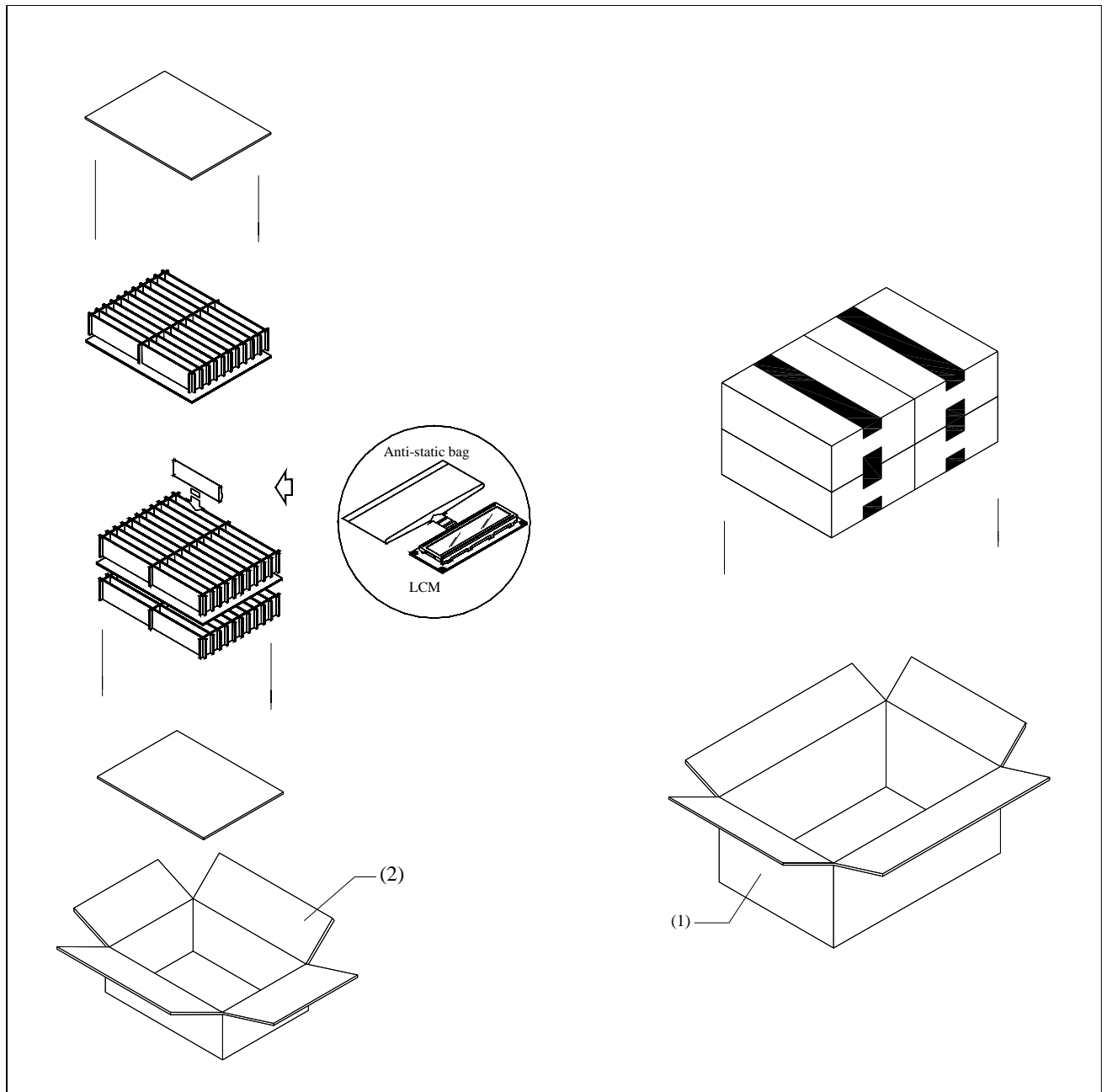
6. LIMITED WARRANTY

Unless otherwise agreed between DATA IMAGE and customer, DATA IMAGE will replace or repair any of its LCD and LCM which is found to be defective electrically and visually when inspected in accordance with DATA IMAGE acceptance standards, for a period on one year from date of shipment. Confirmation of such date shall be based on freight documents. The warranty liability of DATA IMAGE is limited to repair and/or replacement on the terms set forth above. DATA IMAGE will not be responsible for any subsequent or consequential events.

15. OUTLINE DRAWING



16. PACKAGE INFORMATION



| Item | Size(L*W*H) | Quantity | Note |
|---------------------------|-------------|----------------------------|----------|
| 1.Master Carton | 482*282*279 | 1 | |
| 2.Inner Carton | 267*224*115 | 4 | |
| Quantity Per Inner Carton | 10 | Quantity Per Master Carton | 40 |
| N . W | 3.5 (kg) | G . W | 4.5 (kg) |